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**Review**

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# Designer Benzodiazepines Gidazepam and Desalkygidazepam (Bromonordiazepam): What Do We Know?

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## Abstract

Designer benzodiazepines are one of the primary new psychoactive substance (NPS) threats around the world, being found in large numbers in postmortem, driving under the influence of drugs and drug-facilitated sexual assault cases. Even though when compared to many other NPS types, such as opioids and cathinones, there are relatively few designer benzodiazepines being monitored. Recently, a new NPS benzodiazepine has been reported in Europe, the USA and Canada, desalkygidazepam, also known as bromonordiazepam. This substance is a metabolite of the prodrug gidazepam, a drug licensed for use in Ukraine and Russia under the name Gidazepam IC®. In the paper, we review what is currently known about the use, pharmacology and analytical detection of gidazepam, its metabolite desalkygidazepam and their other possible metabolites.

## Introduction

Designer benzodiazepines, more correctly termed new psychoactive substance (NPS) benzodiazepines, are one of the primary NPS threats around the world being found in a large number in postmortem, driving under the influence of drugs (DUID) and drug-facilitated sexual assault cases (1, 2). In Europe, the first report of an NPS benzodiazepine to the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) was the emergence of phenazepam in 2007 (1). As of October 2022, the EMCDDA is monitoring 35 NPS benzodiazepines. Most of the NPS benzodiazepines that are being monitored are orphan drugs that were patented by drug companies but then abandoned without being brought to the market (3). However, some of the NPS benzodiazepines are drugs that have been licensed for clinical use but are restricted to specific geographical areas/countries. The most common NPS benzodiazepine of this type is etizolam, licensed for use in Japan, Italy and India, which has become one of the most abused NPS benzodiazepines around the world (2). The producers of NPS are always looking for new drugs to market, particularly ones that may avoid relevant drug legislation around the world. There are two benzodiazepines with limited geographical distribution, Cinazepam (Levana IV®) and Gidazepam (Gidazepam IC®) that are prescription-only medicines in Ukraine and Russia, respectively, and that had not emerged as NPS benzodiazepines until recently. Cinazepam was first reported to the EMCDDA in 2019, and while gidazepam has not currently emerged as an NPS benzodiazepine, there are concerns that it may soon (4, 5). The active metabolite of gidazepam, desalkylgidazepam, has recently been reported to the EMCDDA and has also been detected by drug testing services in Canada (6), the UK (7) and the USA (8). To date, there is limited information about gidazepam and desalkylgidazepam outside of the Ukrainian and Russian language literature. In this paper, we review what is currently known with regard to the use, pharmacology and analytical detection of gidazepam, desalkylgidazepam and their potential metabolites.

Gidazepam (CAS number 129,186–29-4; 2-(7-bromo-2-oxo-5-phenyl-2,3-dihydro-1 H-1,4-benzodiazepin-1-yl)acet ohydrazide; Figure 1) also known as hydazepam or hidazepam is a 1,4-benzodiazepine that was developed in Kyiv, Ukraine, in the early 1990s. Gidazepam is available as a prescription-only medicine under the trade name Gidazepam IC® in Ukraine and Russia, being released to the market in 1997 (9), in both tablet and sublingual formulations (10). In 2016, gidazepam had ~7.7% of the market share of anxiolytic market in Ukraine (11). As with many other benzodiazepines, gidazepam is used to treat anxiety, alcoholic withdrawal and migraines. It is also used preoperatively, but it is not licensed for use in children (12). Gidazepam is available as either 20 or 50 mg tablets. The recommended dosage depends on the condition that is being treated and is 40–60 mg per day for migraines, 60–200 mg per day for anxiety-associated disorders and 50–500 mg per day for alcoholic withdrawal (12). The maximum recommended duration of use is 4 months (12).

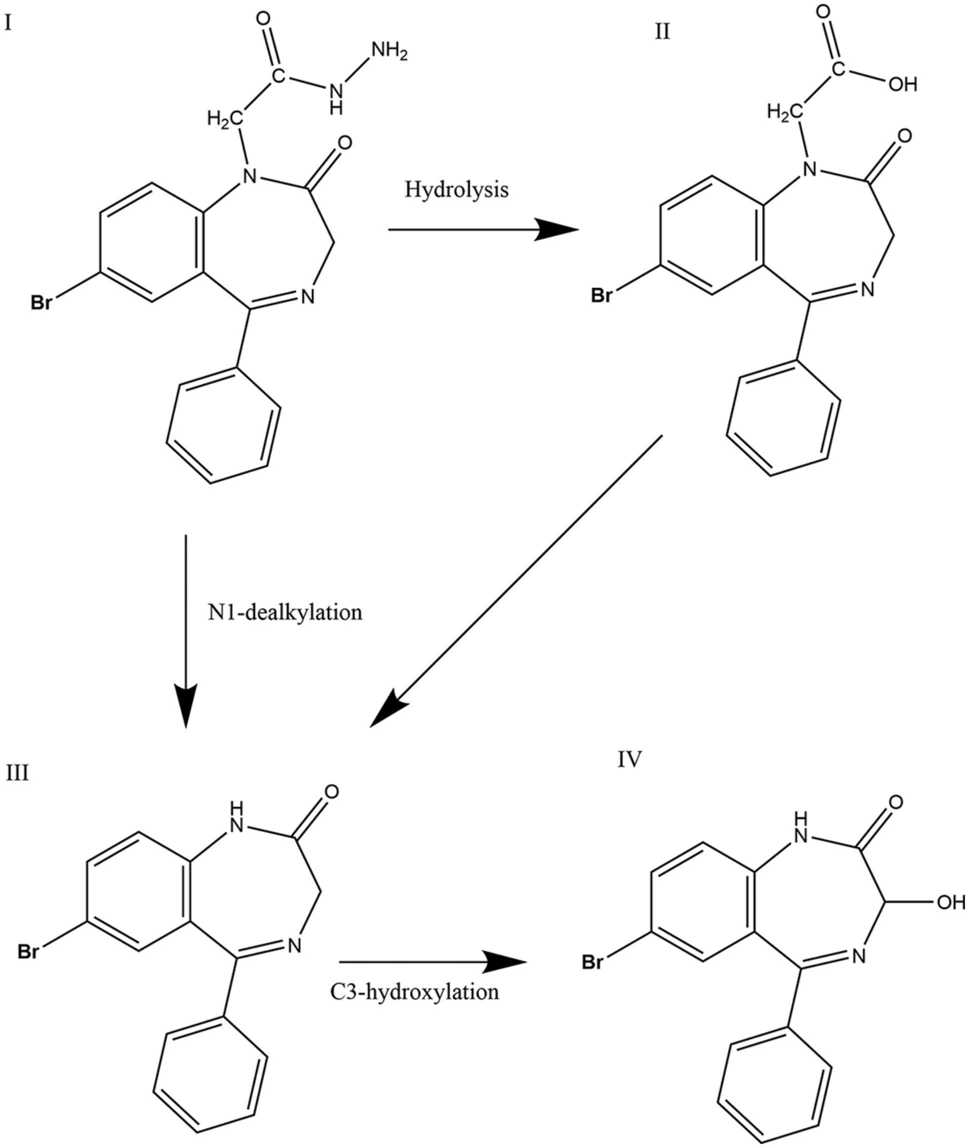


**Figure 1.** Metabolism of gidazepam: I—gidazepam, II—carboxymethylgidazepam, III—desalkylgidazepam (bromonordiazepam) and IV—3-hydroxydesalkylgidazepam.

## Pharmacology of Gidazepam and Its Metabolites

### Pharmacokinetics

In the literature, there are two human studies investigating the pharmacokinetics of gidazepam after oral dosing. The first study consisted of five individuals who were all administered 50 mg of gidazepam with blood samples being taken at sufficient intervals to allow the determination of various important pharmacokinetic parameters (see Table I) (13). The second study was carried out on 18 individuals of between 20 and 50 years old. These individuals were given an initial gidazepam dose of 50 mg followed by a daily dose of 100–200 mg for up to 3 weeks (14). The only detectable substance in humans was the metabolite of gidazepam, desalkylgidazepam (see Figure 1). Desalkygidazepam is also known as bromonordiazepam, due to the substitution of the chlorine atom in nordiazepam with a bromine atom giving desalkygidazepam. The pharmacokinetic parameters determined from these studies are detailed in Table I and refer to desalkygidazepam. The volume of distribution ($V_d$) of desalkygidazepam is on average 4.27 L/kg, which is relatively high when compared to other benzodiazepines (3, 15). This high $V_d$ indicates that in postmortem cases, desalkygidazepam is likely to exhibit postmortem redistribution (16). The half-life of desalkylgidazepam is on average 86.73 h, and this is longer than most benzodiazepines and would put gidazepam into the category of a long-acting benzodiazepine, as its half-life ($t_{1/2}$) is >24 h (15). There are no *in vivo* studies in the literature on the bioavailability of gidazepam in humans, but based on animal studies and other benzodiazepines, it is likely to be >70% (17), with *in silico* studies putting the bioavailability at ~99% (18). Gidazepam is thought to be more rapidly absorbed into the blood from the gastrointestinal tract than other benzodiazepines (19). Desalkylgidazepam is thought to have a slower rate of absorption than its parent compound, but still within the typical absorption rates observed for other benzodiazepines (19).

**Table I. Pharmacokinetic Properties of Desalkylgidazepam in Humans Following a 50 mg Dose ($N = 5$)**

| Pharmacokinetic parameter | Value |
|---|---|
| $C_{max}$ | $0.103 \pm 0.018$ mg/L |
| $T_{max}$ | $4.8 \pm 2.3$ h |
| Plasma clearance ($Cl_{app}$) | $0.035 \pm 0.002$ L/h/kg |
| Volume of distribution ($V_d$) | $4.27 \pm 0.91$ L/kg |
| Elimination rate constant ($K_{el}$) | $0.0082 \pm 0.0007\ h^{-1}$ |
| Half-life ($t_{1/2}$) | $86.73 \pm 6.37$ h |

All data taken from (13).

**Table II. Pharmacodynamic Parameters for Gidazepam and Its Metabolites**

| Substance | *In vitro* Ki (mol/L) | Antagonism of corazole ($ED_{50}$) mg/kg |
|---|---|---|
| Gidazepam | $2200 \pm 76$ | 0.36 |
| Desalkygidazepam | $12.0 \pm 0.2$ | 0.11 |
| Carboxymethylgidazepam | >2000 | >2000 |
| 3-hydroxydesalkylgidazepam | $14.5 \pm 0.6$ | 0.25 |

All data taken from (26, 28).

## Metabolism of gidazepam

As briefly mentioned earlier, human studies have shown that gidazepam is a prodrug that is quickly metabolized via dealkylation into its active metabolite desalkylgidazepam, although other metabolites have been described (see Figure 1). To date, only desalkylgidazepam has been detected in blood following the administration of oral gidazepam (13, 14). However, with newer analytical techniques having increased sensitivity (such as liquid chromatography–tandem mass spectrometry (LC–MS-MS) or liquid chromatrography–time of flight mass spectrometry (LC–TOF-MS)), it is possible to find the metabolites present in low concentrations in human blood. All the metabolites of gidazepam shown in Figure 1 have been detected in urine in the following approximate percentages: gidazepam 6–15%; desalkylgidazepam 10–15%; carboxymethylgidazepam 50–70% and 3-hydroxydesalkylgidazepam glucuronide 5–15%. No data have been given in the literature about the likely concentrations of these metabolites that have been detected in urine analysis (20). To date, only an *in silico* study was carried out to investigate the metabolic enzymes involved in the Phase I metabolism of gidazepam in humans, which suggests that CYP2D6 and CYP3A4 are the major metabolic enzymes involved (18). However, there are mice studies that show CYP2C19 is involved in the metabolism of gidazepam, at least in animals (21). All of these enzymes are commonly involved in the metabolism of other benzodiazepines (3). The only Phase II metabolite that has been reported in the literature is the glucuronide of 3-hydroxydesalkylgidazepam (20), and it is unclear which metabolic enzyme is involved.

## Pharmacodynamics

### *In vitro* and *in silico* studies

As with other 1,4-benzodiazepines, gidazepam and its metabolites bind to, and exhibit activity via, the gamma-aminobutyric acid type A (GABA-A) receptor (see Table II). Gidazepam also binds to the translocator protein (TSPO) (22) (formerly known as the peripheral benzodiazepine receptor (23)), with gidazepam being shown to have a three-fold higher affinity for the TSPO than central nervous system benzodiazepine receptors ($IC_{50}$: 710 and 2200 nmol/L, respectively (22)). Another NPS benzodiazepine, 4′-chlorodiazepam (reported to the EMCDDA in 2016), also binds strongly to the TSPO (24). However, 4′-chlorodiazepam does not bind to the GABA-A receptor, in contrast to gidazepam. The pharmacological actions elicited by the binding of benzodiazepines to the TSPO are as yet, unclear but may involve stimulating the synthesis of neuroactive steroids such as allopregnanolone. These neuroactive steroids are positive allosteric modulators of GABA-A receptors and produce similar physiological effects to benzodiazepines upon binding to these receptors (25). The interaction of gidazepam and its metabolites to the GABA-A receptor has been characterized by both *in vitro* displacement binding studies (26, 27) and *in silico* studies (4). Gidazepam has been described as a partial agonist of the GABA-A receptor (27). The Ki of gidazepam is $2200 \pm 50$ nM and the Ki of desalkylgidazepam is $3.5 \pm 0.2$ nM, suggesting that desalkylgidazepam has the greater affinity for the GABA-A receptor (27). The metabolite carboxymethylgidazepam is considered to be inactive. The pharmacological potencies of gidazepam and its metabolites are mirrored by *in vivo* models of seizure activity that use pentylenetetrazol (corazole) to induce seizures. These results again show that carboxymethylgidazepam is inactive with desalkygidazepam being the most potent of the remaining parent drug and metabolites (28) (see Table II).

## Clinical and *in vivo* studies

In clinical and other *in vivo* animal studies, gidazepam has been shown to have a unique spectrum of pharmacological activity that distinguishes it from other benzodiazepines. Gidazepam has prominent anxiolytic properties without producing the sedative and muscle relaxant effects that are associated with other benzodiazepines, such as diazepam (22). This has been demonstrated in both animal models and clinical (human) studies. A study into the pharmacological effects of gidazepam and diazepam on inbred C57Bl/6 (B6) and Balb/c (C) mice using "open-field" testing found that diazepam at low doses either stimulated the behavior of C mice or inhibited the activity of B6 mice. In comparison, gidazepam had a low dose range which activated the behavior of C mice, without having a sedative effect on B6 mice (29). This suggests a wide separation between the anxiolytic and sedative dosages of gidazepam, when compared with diazepam, an example of a typical benzodiazepine. In human studies, the lack of sedative effects of gidazepam is confirmed, for example, in a controlled study where subjects were given either 100 mg of gidazepam or a placebo for 14 days and then asked to perform psychological testing investigating alertness, reaction time, attention and memory, there was no significant difference between the placebo and gidazepam (30, 31).

## "Trip reports" from illicit use of desalkylgidazepam (bromonordiazepam)

Reports from the internet of illicit use (so-called "trip reports") can be beneficial in understanding the effects of new NPS drugs (32, 33) It is however important to note that firstly

the users and posters of these reports do not know if the drug they are taking is what they think they are taking and secondly it may not be the only drug they are taking at that time (32, 33). Searches on the internet by the authors have shown that desalkylgidazepam is being advertised for sale on numerous "research chemical" websites for sale either as a powder or as 1 or 2.5 mg "pellets" or 3 mg tablets (for ethical reasons, no information for specific sites are given). These research chemical websites are quoting a dose of 6–9 mg for desalkygidazepam (for ethical reasons, no information for specific sites are given), and this dosage is supported by the various trip reports. The user comments from "trip reports" also confirm the lack of sedative effects, the long half-life and the anxiolytic effects, but also that gidazepam and desalkylgidazepam use may not become widespread. Some comments are as follows: "It's a quite functional benzo, very little hypnotic effects but eliminates anxiety very well [.] I've got up to 30 mg with it and no ill effects from that dosage […] I feel like it would be a good tapering benzo due to the long half-life and not much recreational potential" (34). "I tried bromonordiazepam and it was the worst I've ever tried [.] the effects were weird. It made me unable to think clearly, it felt like I've only got two brain cells left [.]. I had a breakdown taking this after staying awake for three days and it totally escalated. I ended up in the hospital after having a fight with my boyfriend about literally nothing. I was acting totally crazy. Absolutely not recommended!" (34) and "I did 9 mg one hour after breakfast [.] It felt like 15 mg of diazepam would feel, but with less sedation and with next to no muscle relaxation. [.] highly specific for anxiety reduction, 9 mg had no mellow feeling you'd get from diazepam'. [bromonordiazepam] worked very subtle, that's probably the reason why folks with tolerance get next to nothing out of it, but I'm sure it could be a good option for a taper. [.] [I] couldn't see any real recreational advantage of the drug." (35) "Well it [.] feels like diazepam except it works for almost two days." (36) "with no benzo tolerance I found 6 mg being a good anti-anxiety drug. I haven't pushed it higher than 9 mg, but it had obvious benzo type effects from 9 mg. Desalkylgidazepam [effects are] mostly anti-anxiety, not super heavy sedation. I did feel good though … might be ok for maintaining" (37). Overall, the trip reports suggest that desalkygidazepam is not really a recreational drug, does not show sedating properties but does show good anxiolytic effects. The trip reports do not mention many side effects, beyond those normally expected of benzodiazepines.

## Gidazepam and Metabolites Blood Concentrations and Side Effects

### Blood concentrations of gidazepam and its metabolites

The human studies with oral gidazepam dosing allow us to understand the blood concentrations of desalkygidazepam that are likely to be found with clinical usage. When a blood sample was taken 4 h after an initial 50 mg dose of gidazepam, a mean desalkylgidazepam concentration of 0.19 mg/L (range 0.06–0.48 mg/L; median 0.15 mg/L) was observed (14). In this study, the initial dose of gidazepam was followed by a gidazepam dose of 100–200 mg (mean 129 mg) for up to 3 weeks to mimic clinical usage (14). Fourteen days after the initial 50 mg dose was given, a blood sample was taken allowing the determination of the desalkylgidazepam concentration at steady state ($C_{ss}$). The mean desalkylgidazepam $C_{ss}$ was 2.68 mg/L (range 0.93–6.00 mg/L; median 1.73 mg/L). No further pharmacodynamic information was presented in the study after Day 14 (14). When a single 50 mg dose of gidazepam was given to five individuals, the average peak blood gidazepam concentration observed was 0.103 mg/L (13). To date, there have been no published studies on the concentrations of gidazepam or any of its metabolites in overdose, from postmortem or DUID cases.

**Table III.** Acute Oral $LD_{50}$ Values of Various Benzodiazepines in Mice

| Benzodiazepine | $LD_{50}$ (mg/kg) | Reference |
|---|---|---|
| Desalkygidazepam | 600 | (28) |
| Diazepam | 692 | (41) |
| 3-Hydroxydesalkylgidazepam | 933 | (28) |
| Gidazepam | 1700 | (29) |
| Etizolam | 1785 | (45) |
| Carboxymethylgidazepam | >2000 | (28) |

### Side effects of gidazepam and its metabolites

Although gidazepam has demonstrated relatively mild and few side effects, in comparison to other benzodiazepines during clinical use at therapeutic level doses, it still holds the potential to cause significantly more serious and harmful effects at higher dosage levels. Reported side effects from clinical use include drowsiness, weakness, myasthenia gravis, addiction, dysmenorrhea and allergic reactions (9). Recreational use of gidazepam, like other benzodiazepines, poses a significantly higher risk of negative effects, particularly if used in combination with other substances (38). Large doses of gidazepam, especially in the elderly, are reported to cause impaired coordination, ataxia and severe muscle weakness. These effects are noted to reduce 1–2 days after dose reduction or complete withdrawal (39). Known effects from interactions with other substances include the enhancement of the effects from alcohol, hypnotics, neuroleptics, antipsychotic drugs and narcotic analgesics (40).

### $LD_{50}$ of gidazepam and its metabolites

Although there is limited information on gidazepam in overdose, there is however some information on its potential toxicity. The $LD_{50}$ (the amount of material given all at once, which causes the death of 50% of a group of test animals) from animal studies is not directly comparable with human toxicity but can give an indication of the potential comparative toxicity of a compound when compared to other similar compounds. As the $LD_{50}$ of gidazepam and its metabolites has been determined in mice (28), we can compare them to the $LD_{50}$ of etizolam and diazepam in mice (41). As can be seen from Table III, the toxicity in the order of potency is desalkygidazepam > diazepam > 3-hydroxydesalkylgidazepam > gidazepam > etizolam > carbox ymethylgidazepam. These data suggest that gidazepam has a similar comparative toxicity to etizolam and its main metabolite desalkylgidazepam has a similar toxicity to diazepam. It is important to note that benzodiazepines are considered to have a very good safety profile when using clinically (42).

## Analysis of Gidazepam and Its Metabolites

The analysis of gidazepam and its metabolites, particularly desalkygidazepam, is important for understanding their use, abuse and potential risks of use. To date, several methods have been described in the literature for both the extraction and analysis of gidazepam and its metabolites.

### Extraction

Studies have shown that gidazepam and its metabolites can be extracted from blood, tissues and urine using both solid-phase extraction (SPE) and liquid–liquid extraction (LLE) with high extraction efficiency.

#### Solid Phase Extraction (SPE)

The extraction efficiency of SPE was, on average, between 72% and 98% for gidazepam and its metabolites (desalkylgidazepam, carboxymethylgidazepam and 3-hydroxydesalkylgidazepam) in blood and urine (43), using a 3 mL Agilent Bond Elut Certify SPE column and a slightly adapted version of the methodology (Agilent Technologies) (44). The SPE column was conditioned with 2 mL of methanol, 2 mL of distilled water and 1 mL of 0.1 M phosphate buffer solution (pH 6.0). Following the conditioning, 1 mL of sample (1 mL of either blood or urine) was loaded into the column. The column was then washed with 3 mL of distilled water, 1 mL of 1 M acetic acid and 3 mL of methanol and then air-dried for 5 min. The analytes were eluted from the column with a 2 mL of a mixture of dichloromethane/isopropyl alcohol/ammonia solution (78/20/2). The eluate was then evaporated to dryness at ≤40°C. The eluent can then either be reconstituted in mobile phase for high-performance liquid chromatrography (HPLC) use or derivatized with 50 μL of N,O-Bis(trimethylsilyl)trifluoroacetamide (BSTFA) (with 1% Trimethylchlorosilane) for 20 min at 70°C.

#### Liquid-Liquid Extraction (LLE)

The earliest published methods of analysis of gidazepam and its metabolites utilized double ether extraction at pH 9.0 (13, 14), with an average extraction efficiency for gidazepam of 76%, desalkygidazepam of 80% and 3-hydroxydesalkylgidazepam of 83% (14). The use of ether was a common extraction method for benzodiazepines in the past (45), but due to modern health and safety concerns, it has been replaced by safer solvents. A more recent study investigated the use of various solvents for the extraction of desalkygidazepam. The two most efficient solvents are ethyl acetate (98%) and a chlorobutane:ethyl acetate mix (9:1). The method of extraction is as follows: to 1 mL of blood, 1 mL of borate buffer solution (pH 9) was added. This was followed by 5 mL of chlorobutane:ethyl acetate or ethyl acetate. The sample was centrifuged for 5 min at 3000 rpm. The organic phase was then removed and evaporated under air at 40°C (20). This was followed by either reconstitution in mobile phase or derivatization (see later), depending on the analytical method to be used.

### Chromatographic analysis of gidazepam and metabolites

Methods using high-performance liquid chromatography with ultra-violet spectroscopy (HPLC–UV) and two-dimensional chromatography–mass spectrometry (GC-GC–MS) have been published for the detection of gidazepam and its metabolites. The published methods are described in detail later.

#### GC-GC–MS analysis

*Blood and tissues*

The GC-GC–MS methodology for the detection and quantitation of gidazepam and metabolites is described in detail (46, 47). The method was validated according to the United Nations guidelines (48). In brief, an Agilent 6890 N/5973 N/flame ionization detector (FID) GC–MS fitted with a Deans switch (49) was utilized. The switch allows the carrier gas to be sent either via Column 1 (HP-5MS 0.25 mm × 30 m) to the FID or via Column 2 (DB-17MS 0.25 mm × 30 m) to the MS detector. The quantitation of desalkylgidazepam was validated for both tissue (exact tissue used not further described) (1 g) and blood (1 mL), with phenazepam (1 μg/ml) being used as the internal standard. This was extracted (as detailed earlier) and then derivatized with BSTFA. The method had an limit of detection (LOD) of 3 ng/mL (blood) and 5 ng/g (tissue). The calibration range was 20–1000 ng/mL in blood and 0.2–10 μg/g in tissues. The $r^2$ of the calibration curve was 0.999 assuming a linear model, with inter and intraday precision of the method being <15%.

*Urine*

This method describes the detection of benzodiazepine benzophenones following alkaline hydrolysis of urine. The advantage of this method is that the benzophenone aminocarboxybromobenzophenone (ACBB; Figure 2) is unique to gidazepam allowing the confirmation of gidazepam use. The alkaline hydrolysis was carried out as follows: to 1 mL urine in a screw-capped test tube, 0.15 mL of 40% (w/w) sodium hydroxide was added, the cap was screwed on to the test tube and it was allowed to stand in a boiling water bath for 20 min. After hydrolysis, the test tube was cooled, and the pH was adjusted to 2–3 for LLE or to pH 6–7 for SPE with 2.0 M hydrochloric acid (HCl).

#### HPLC analysis

*Method 1 (13): an HPLC–UV method for the quantitation of gidazepam and its metabolites (I–IV)*

This method used a Beckman Altex 160 Absorption Analyzer HPLC System. The flow rate was 1 mL/min and used an ethanol:glycine buffer (pH 2.2) mobile phase (4.3:5.7). This isocratic method used an Ultrasphere C18 (5 μm, 4.6 × 150 mm) column at room temperature. The UV detector was set to 254 nm. Diazepam was used as the internal standard. Gidazepam and metabolites were extracted from blood plasma by double extraction with diethyl ether at pH 9.0. No information was provided about the validation, LOD, Limit of quantitation or the concentrations of the analytes used in the calibration curve.

*Method 2 (50): an HPLC–UV method for the quantitation of gidazepam and its metabolites (I–IV)*

The method used PerkinElmer HPLC equipped with an isocratic pump (PE-250) and UV detector (PE-290). The flow rate was 1.5 mL/min and used an 0.02 M 3-(N-morpholino)propanesulfonic acid:1 N HCl:acetonitrile:methanol (40:1:22.5:2.5) buffer. This isocratic method used

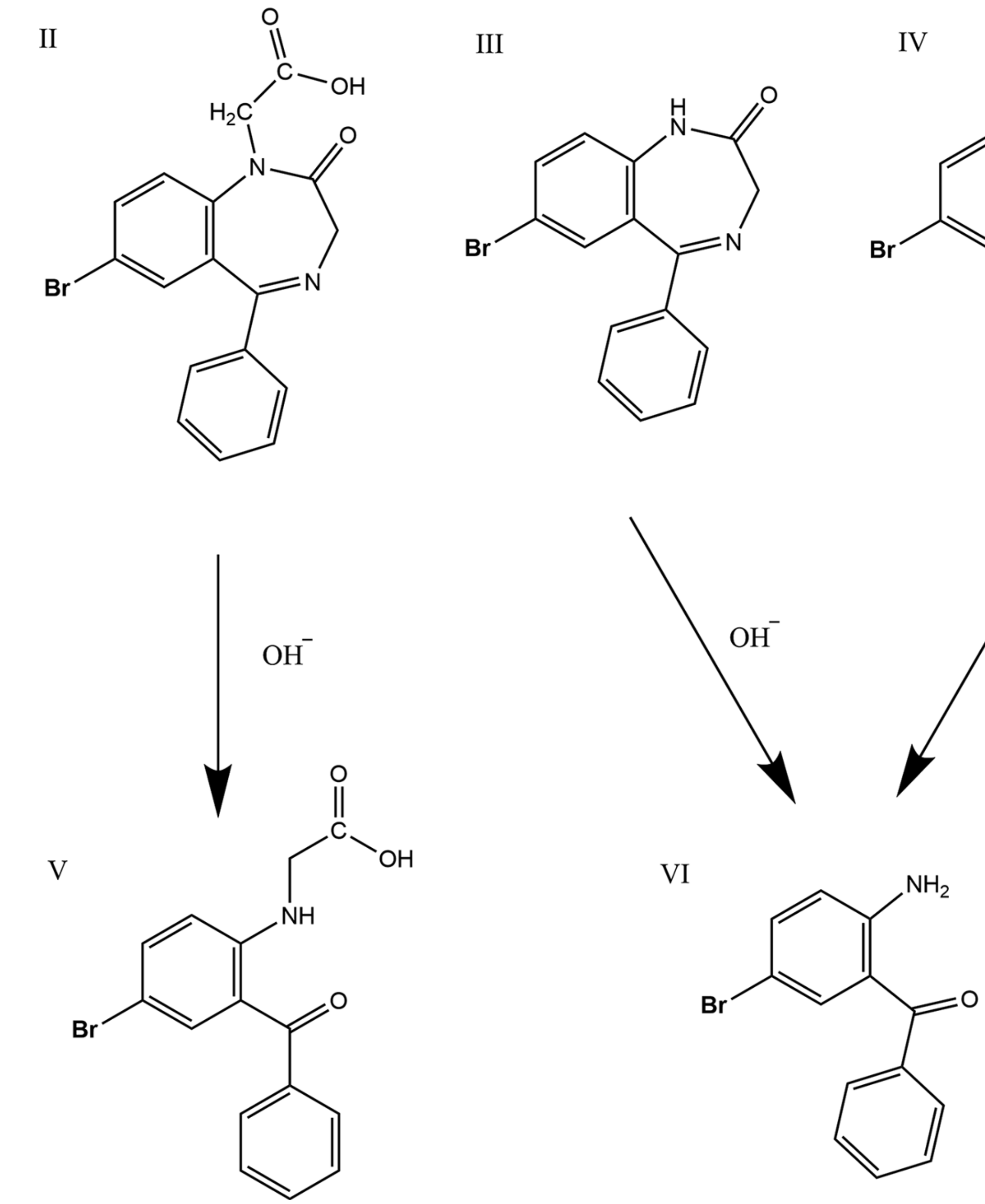


**Figure 2.** Formation of gidazepam metabolite aminobenzophenones by hydrolysis: II—carboxymethylgidazepam, III—desalkylgidazepam (bromonordiazepam), IV—3-hydroxydesalkylgidazepam, V—ACBB and VI—aminobromobenzophenone.

a LiChrosorb® RP-18 (7 μm, 4.6 × 250 mm) column at room temperature. The injection volume was 20 μL. The UV detector was set to 232 nm. Experimental samples (obtained by centrifugation of blood at 3000 rpm for 15 min) were added with a two-fold volume of 1 M borate buffer (pH 9.0) and extracted with a 10× volume of diethyl ether for 10 min on an electric shaker. The extraction was carried out twice. For the subsequent purification of the analyzed compounds, acid back extraction with a 6 M HCl solution followed by neutralization with a 6 M sodium hydroxide solution was used. The neutralized solution was shaken twice with an equal volume of freshly distilled ether. The ether extracts were purified and evaporated in a stream of nitrogen, after which the test tubes were placed in a vacuum desiccator with phosphorus pentoxide for 2 h. The dry residue was dissolved in 0.1–0.3 mL of acetonitrile containing an external standard (diazepam, 8 μg/mL): the calibration curves were described as being linear between 0.5 and 10 μg/mL (number of points unknown) with an $r^2$ of >0.999. The retention times were as follows: gidazepam 3.68 min, desalkygidazepam 5.29 min and diazepam 8.0 min. The LOD for gidazepam was 45.0 ng/mL and for desalkylgidazepam was 40.0 ng/mL. The percentage of extraction of gidazepam was on average 76% and for desalkylgidazepam 80%.

It is expected that up-to-date methods of benzodiazepine analysis as detailed in a previous study (3) would be easily

adapted for the detection and quantitation of gidazepam and metabolites if LC–MS-MS analysis was required.

## Conclusions

Gidazepam and its active metabolite desalkygidazepam are benzodiazepines that may soon become drugs of abuse. This paper allows forensic and clinical practitioners to understand what is known about gidazepam and its metabolites to date and how to analyze them should they become commonly used and abused.

## Data availability

There are no new data associated with this article.

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